

**330 SURFACE REQUIREMENTS.**  
**(REV 2-13-06) (FA 3-8-06) (7-06)**

ARTICLE 330-12 (Pages 239-242) is deleted and the following substituted:

**330-12 Surface Requirements.**

**330-12.1 General:** Construct a smooth pavement with good surface texture and the proper cross-slope.

**330-12.2 Texture of the Finished Surface of Paving Layers:** Produce a finished surface of uniform texture and compaction with no pulled, torn, raveled, crushed or loosened portions and free of segregation, bleeding, flushing, sand streaks, sand spots, or ripples. Correct any area of the surface that does not meet the foregoing requirements in accordance with 330-12.5.1.

Do not use asphalt concrete mixtures containing aggregates that cause a different color appearance in the final wearing surface in sections less than 1 mile [1.5 km] in length and across the full width of the roadway unless approved by the Engineer.

**330-12.3 Cross Slope:** Construct a pavement surface with cross slopes in compliance with the requirements of the Contract Documents. Furnish a level with a minimum length of 4 feet [1.2 m] or a digital measuring device approved by the Engineer for the control of cross slope. Make this level or measuring device available at the jobsite at all times during paving operations. Utilize electronic transverse screed controls on the paving machine (unless directed otherwise by the Engineer) to obtain an accurate transverse slope of the pavement surface.

**330-12.3.1 Quality Control Requirements:** Measure the cross slope of the pavement surface by placing the measuring device perpendicular to the roadway centerline. Report the cross slope to the nearest 0.1%. Record all the measurements on an approved form and submit to the Engineer for documentation.

Measure the cross slope at a minimum frequency of one measurement every 100 feet [30 m] during paving operations to ensure that the cross slope is uniform and in compliance with the design cross slope. When the difference between the measured cross slope and the design cross slope exceeds  $\pm 0.2\%$  for travel lanes (including turn lanes) or  $\pm 0.5\%$  for shoulders, make all corrections immediately to bring the cross slope into the acceptable range.

When the cross slope is consistently within the acceptable range, upon the approval of the Engineer, the frequency of the cross slope measurements can be reduced to one measurement every 250 feet [70 m] during paving operations.

**330-12.3.2 Verification:** The Engineer will verify the Contractor's cross slope measurements by randomly taking a minimum of ten measurements of the cross slope over a day's production. If the average cross slope of the ten random measurements varies more than the allowable tolerance from the design cross slope (0.2% for travel lanes including turn lanes and 0.5% for shoulders), take immediate action to bring the cross slope into the acceptable range. A recheck of the cross slope will then be made following the adjustment. If the recheck indicates that the cross slope is still out of tolerance, stop the paving operations and correct the deficient section in accordance with 330-12.5.1. Resume paving operations only upon approval of the Engineer. The Engineer reserves the right to verify the pavement cross slope at any time by taking cross slope measurements as described above.

The Engineer may waive the corrections specified above (at no reduction in payment) if:

1) the deficiencies are sufficiently separated so as not to affect the overall ride quality, traffic safety and surface drainage characteristics of the pavement and;  
2) the corrective action would unnecessarily mar the appearance of the finished pavement.

For intersections, tapers, crossovers, transitions at beginning and end of project and similar areas, adjust the cross slope to match the actual site conditions or as directed by the Engineer.

**330-12.4 Pavement Smoothness:** Construct a smooth pavement meeting the requirements of this Specification.

**330-12.4.1 General:** Furnish a 15 foot [4.572 m] manual and a 15 foot [4.572 m] rolling straightedge meeting the requirements of FM 5-509. Make them available at the job site at all times during paving operations. Obtain a smooth surface on all pavement courses placed, and then straightedge all final structural and friction course layers in accordance with 330-12.4.5.

**330-12.4.2 Test Method:** Perform all straightedge testing in accordance with FM 5-509 with one pass of the rolling straightedge operated along the outside wheel path of each lane being tested. The Engineer may require additional testing at other locations within the lane.

**330-12.4.3 Traffic Control:** Provide traffic control in accordance with Section 102 and the Design Standards Index Nos. 607 or 619 during all testing. When traffic control cannot be provided in accordance with Index Nos. 607 or 619, submit an alternative Traffic Control Plan as specified in 102-4. Include the cost of this traffic control in the Contract bid prices for the asphalt items.

**330-12.4.4 Process Control Testing:** Assume full responsibility for controlling all paving operations and processes such that the requirements of these Specifications are met at all times. Address in the QC Plan the methods to be used to control smoothness.

**330-12.4.5 Quality Control Testing:**

**330-12.4.5.1 General:** Straightedge the final Type SP structural layer and friction course layer with a rolling straightedge. Test all pavement lanes and ramps where the width is constant using a rolling straightedge and document all deficiencies on a form approved by the Engineer. Notify the Engineer of the location and time of all straightedge testing a minimum of 48 hours before beginning testing.

**330-12.4.5.2 Rolling Straightedge Exceptions:** Testing with the rolling straightedge will not be required in the following areas: intersections, tapers, crossovers, parking lots and similar areas. In addition, testing with the rolling straightedge will not be performed on the following areas when they are less than 50 feet [15 m] in length: turn lanes, acceleration/deceleration lanes and side streets. However, correct any individual surface irregularity in these areas that deviates from the plan grade in excess of 3/8 inch [10 mm] as determined by a 15 foot [4.572 m] manual straightedge, and that the Engineer deems to be objectionable, in accordance with 330-12.5.1.

In addition, the Engineer may also waive the straightedging requirements on ramps and superelevated sections where the geometrical orientation of the pavement results in an inaccurate measurement with the rolling straightedge.

**330-12.4.5.3 Intermediate Layers:** Straightedge all intermediate Type SP layers (structural and overbuild) as necessary to construct a smooth pavement. On roadways with a design speed 50 miles per hour [80 km per hour] or greater, when an intermediate Type SP layer will be opened to traffic, straightedge the pavement with a rolling straightedge and correct

all deficiencies in excess of 3/8 inch [10 mm] within 72 hours of placement, unless directed otherwise by the Engineer. Correct all deficiencies in accordance with 330-12.5.1.

**330-12.4.5.4 Final Type SP Structural Layer:** Straightedge the final Type SP structural layer with a rolling straightedge, either behind the final roller of the paving train or as a separate operation. The Engineer will verify the straightedge testing by observing the Quality Control straightedging operations. Correct all deficiencies in excess of 3/16 inch [5 mm] in accordance with 330-12.5.1, and retest the corrected areas prior to placing the friction course.

For bicycle paths, straightedge the final structural layer with a rolling straightedge, either behind the final roller of the paving train or as a separate operation. Correct all deficiencies in excess of 5/16 inch [8 mm] in accordance with 330-12.5.1. Retest all corrected areas. If the Engineer determines that the deficiencies on the bicycle path are due to field geometrical conditions, the Engineer will waive corrections with no deduction to the pay item quantity.

**330-12.4.5.5 Friction Course Layer:** Acceptance for pavement smoothness will be based on verified Quality Control measurements using the rolling straightedge. The Engineer will verify the straightedge testing by observing the Quality Control straightedging operations.

At the completion of all paving operations, straightedge the friction course as a separate operation. As an exception, if approved by the Engineer, straightedge the friction course behind the final roller of the paving train. Correct all deficiencies in excess of 3/16 inch [5 mm] in accordance with 330-12.5.1. Retest all corrected areas.

**330-12.5 Correcting Unacceptable Pavement:**

**330-12.5.1 General:** Correct all areas of unacceptable pavement at no cost to the Department.

**330-12.5.1.1 Structural Layers:** Correct deficiencies in the Type SP structural layer by one of the following methods:

a. Remove and replace the full depth of the layer, extending a minimum of 50 feet [15 m] on either side of the defective area for the full width of the paving lane.

b. Mill the pavement surface to a depth and width that is adequate to remove the deficiency. (This option only applies if the structural layer is not the final surface layer.)

**330-12.5.1.2 Friction Course:** Correct deficiencies in the friction course layer by removing and replacing the full depth of the layer, extending a minimum of 50 feet [15 m] on either side of the defective area for the full width of the paving lane. Corrections may be waived if approved by the Engineer, and an adjustment to the pay item quantity made as defined in 330-12.5.2.

**330-12.5.2 Reduction in Pay Item Quantity:** When the Engineer elects to waive corrections, the Department will reduce the pay quantity for the pay item in question by the amount of material that the Contractor would have removed and replaced had the correction been made. When the pay quantity is in tons [metric tons], the Department will base the reduction on removing a quantity of material that is 100 feet by the lane width by layer thickness [30 m by lane width by layer thickness] as determined through the following equation:

$$\text{Quantity (tons)} = t \times G_{\text{mm}} \times w \times 0.24$$

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Where:       $t$       = Layer thickness (in.)  
                  $G_{\text{mm}}$    = Maximum specific gravity from the verified mix  
                  $w$       = Lane width (ft.)

#### SI Units

$$\text{Quantity (metric tons)} = t \times G_{\text{mm}} \times w \times 0.028$$

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Where:       $t$       = Layer thickness (mm)  
                  $G_{\text{mm}}$    = Maximum specific gravity from the verified mix  
                  $w$       = Lane width (m)

For FC-5 and other open-graded friction courses, the Department will base the reduction on the area that the Contractor would have removed (100 feet by lane width) [(30 m by lane width)] multiplied by a spread rate of 80 lb/yd<sup>2</sup> [44 kg/m<sup>2</sup>].